FIRE ANT MYRMECOPHILES: FLIGHT PERIODS OF *MYRMECAPHODIUS EXCAVATICOLLIS* (BLANCHARD) AND *EUPARIA CASTANEA* SERVILLE (COLEOPTERA: SCARABAEIDAE)[1]

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ABSTRACT

Flight periods of *Myrmecaphodius excavaticollis* (Blanchard) and *Euparia castanea* Serville in Florida were determined by using blacklight traps. *E. castanea* was collected from February through October, but the main flight period extended from May through September. The peak flight period of *M. excavaticollis* occurred in June and July with almost continuous flights from May until October, and additional flights occurred in warm periods during the winter. No correlation was found between flight periods, air or soil temperatures, or rainfall. Also, no correlation was apparent between beetle flights and the mating flights of the host ants.

Light traps are most often used to obtain insect specimens and to establish distribution records, but they are also useful for determining flight periods of insects. When a light trap is used for this purpose, it must be operated consistently over extended periods of time at the same location. Studies of this kind have been conducted with at least 10 species of Scarabaeidae (Frost 1966a, Gruner 1973, 1975, Wensler 1971).

Some myrmecophiles are flightless and therefore not taken in light traps, but others have been collected almost exclusively from lights or light traps (e.g., Paussidae, LeMasne 1961; *Euparixia* spp., Woodruff and Cartwright 1967; *Rhyparus* spp., Cartwright and Woodruff 1969). In the extensive survey of Florida scarabs by Woodruff (1973), 94.6% of the *Myrmecaphodius excavaticollis* (Blanchard) and 35.1% of the *Euparia castanea* Serville were collected at lights or with blacklight traps. Frost (1964, 1966b, 1969, 1975) did not list *E. castanea* from black light collections at the Archbold Biological Station, Highlands Co., Florida, although he did record its primary host, *Solenopsis geminata* F. (Frost 1964). *Solenopsis invicta* Buren, the main introduced host of the introduced *M. excavaticollis*, did not occur in Highlands Co. (USDA 1967) when Frost operated his light traps (1958-63).

As part of a larger study of the biology of myrmecophiles of fire ants (*Solenopsis* spp.) we report here on the flight periods of the beetles as determined by light trap collections.

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Materials and Methods

The flight periods of *M. excavaticollis* and *E. castanea* were studied in Alachua Co., Florida, with a blacklight trap with 4 15-watt bulbs on open farmland ca. 100 yd west of US 441 on the bluff overlooking the southern edge of Paynes Prairie. The trap was operated from at least 1 hr before sunset to at least 1 hr after sunrise from 1 November 1972 to 31 October 1973 and usually was emptied daily. Two samples, Tuesday and Thursday, were checked each week and all *M. excavaticollis* and *E. castanea* found were removed and counted. The *M. excavaticollis* were sexed by using the shape of the terminal spine on the front tibia (Wojcik and Woodruff unpubl.); the *E. castanea* were not sexed since no external sex characters are known. (When large numbers of *M. excavaticollis* were found, additional samples were also checked during that week.) Data were standardized weekly as no. of beetles/no. of samples checked.

In addition, specimens from Monticello, Jefferson Co., and Tall Timbers Research Station, Leon Co., Florida [specimens from the Florida State Collection of Arthropods (F.S.C.A.), Div. of Plant Industry, Fla. Dept. Agric. and Consumer Services] were obtained from light trap samples sorted for *M. excavaticollis* and *E. castanea*. In these areas samples were available from July 1968 (Monticello) and August 1968 (Tall Timbers) to October 1969. Only data from complete samples were used, and the data were standardized as for the Gainesville data. Because of the paucity of *E. castanea* specimens from these 3 locations, all available light trap records (specimens from the F.S.C.A.) were combined to determine the flight periods of this species.

Results and Discussion

Only 1 *E. castanea* was collected in the Gainesville light trap (7 & 8-IX-73) and only 1 at Tall Timbers (11-VI-69). Six specimens were taken at Monticello (20-VII-68, 20-VIII-68, 5-VII-69, 10-VII-69, and 2 specimens 17-VIII-68). Woodruff (1973) reported the collection of *E. castanea* in light traps in the Gainesville area every month from March through September. We found that the seasonal flight period of specimens collected during this study and from all other Florida light trap collection sites, extended from February through October (Fig. 1). It was therefore curious that Frost (1964) did not collect *E. castanea* since he operated blacklight traps from November through April and this species has been collected in light traps during several of these months from various other locations in southern Florida (Fig. 1). Although this species is attracted to light traps, it was not collected in such large numbers as *M. excavaticollis* in the collections we examined. A reason for the low collection numbers is that the Monticello and Tall Timbers areas are heavily infested with *S. invicta* and only sporadically infested with *S. geminata*. The only ant nests that *E. castanea* has been collected from are nests of *S. geminata* and *S. xyloni* McCook (Wojcik *et al.* 1977). Moreover, this beetle did not survive in laboratory colonies of *S. invicta* (Wojcik and Woodruff unpubl.). This suggests that *E. castanea* will become less common as *S. invicta* spreads because *S. invicta* eliminates or reduces the populations of *S. geminata* and *S. xyloni* (Whitcomb *et al.* 1972, Roe 1973, Naves 1974).

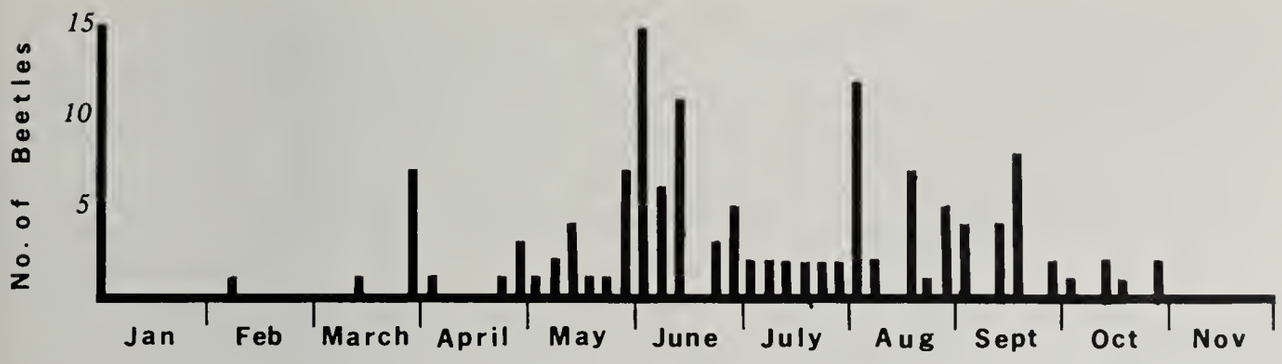

Fig. 1. Summary of all available light trap collections of *E. castanea* in 5-day intervals. Includes collections from all Florida locations, published (Woodruff 1973) and unpublished (Wojcik unpubl.).

The collection data for both sexes of *M. excavaticollis* from Gainesville, Monticello, and Tall Timbers are shown in Fig. 2, 3, and 4, respectively. Large variations in daily collections occurred at each location; maximums of 13, 104, and 85 specimens were taken at Gainesville, Monticello, and Tall Timbers, respectively.

The main flight period of *M. excavaticollis* was from mid-June to mid-July (Fig. 2, 3, 4), although some beetles flew from May until the beginning of October, with additional flights whenever conditions were suitable. The collection data did not correlate with abiotic factors: air temperature, 4- and 8-inch soil temperatures (maximum and minimum for each), and daily rainfall (data from U.S. Dept. Comm. 1968, 1969, 1972, 1973).

During the time the light trap was operated in Gainesville, the infestation of *S. invicta* was light in Alachua Co., and this ant was not known to occur within 5 miles of the light trap. The *M. excavaticollis* population sampled was probably associated with the *S. geminata* population present in the area. *M. excavaticollis* has been collected from the nests of both imported species of fire ants, *S. invicta* and *S. richteri* Forel, and from the nests of two species of native fire ants, *S. geminata* and *S. xyloni* (Wojcik

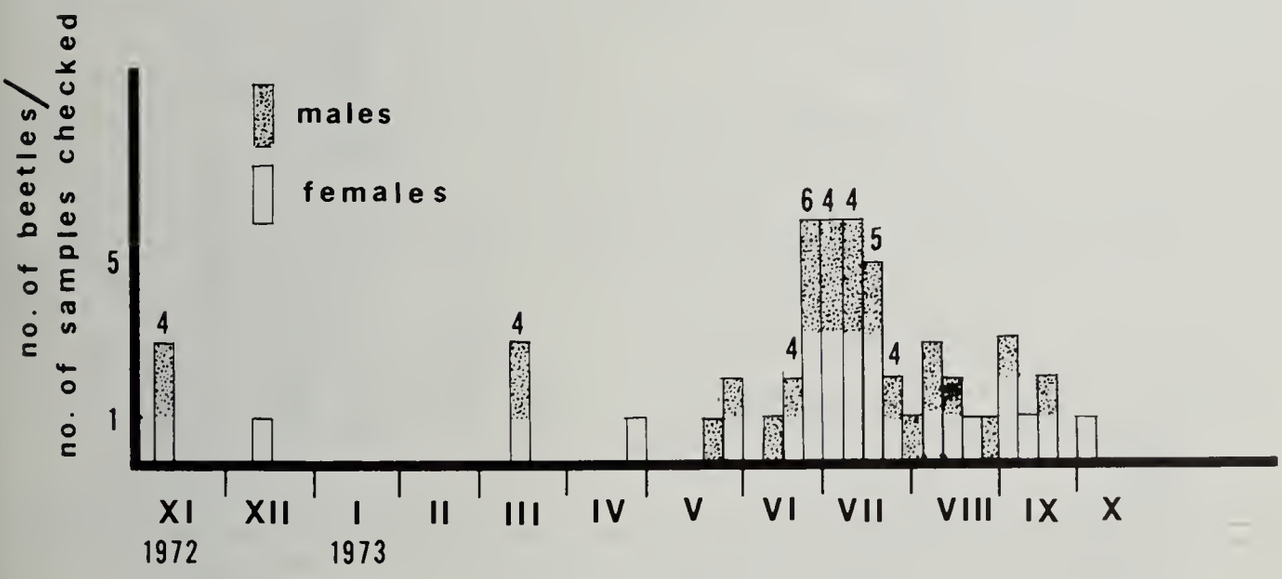

Fig. 2. *M. excavaticollis* collected from a blacklight trap in Gainesville, Florida, in weekly intervals. Two daily samples included in weekly summation except as indicated by numbers above column.

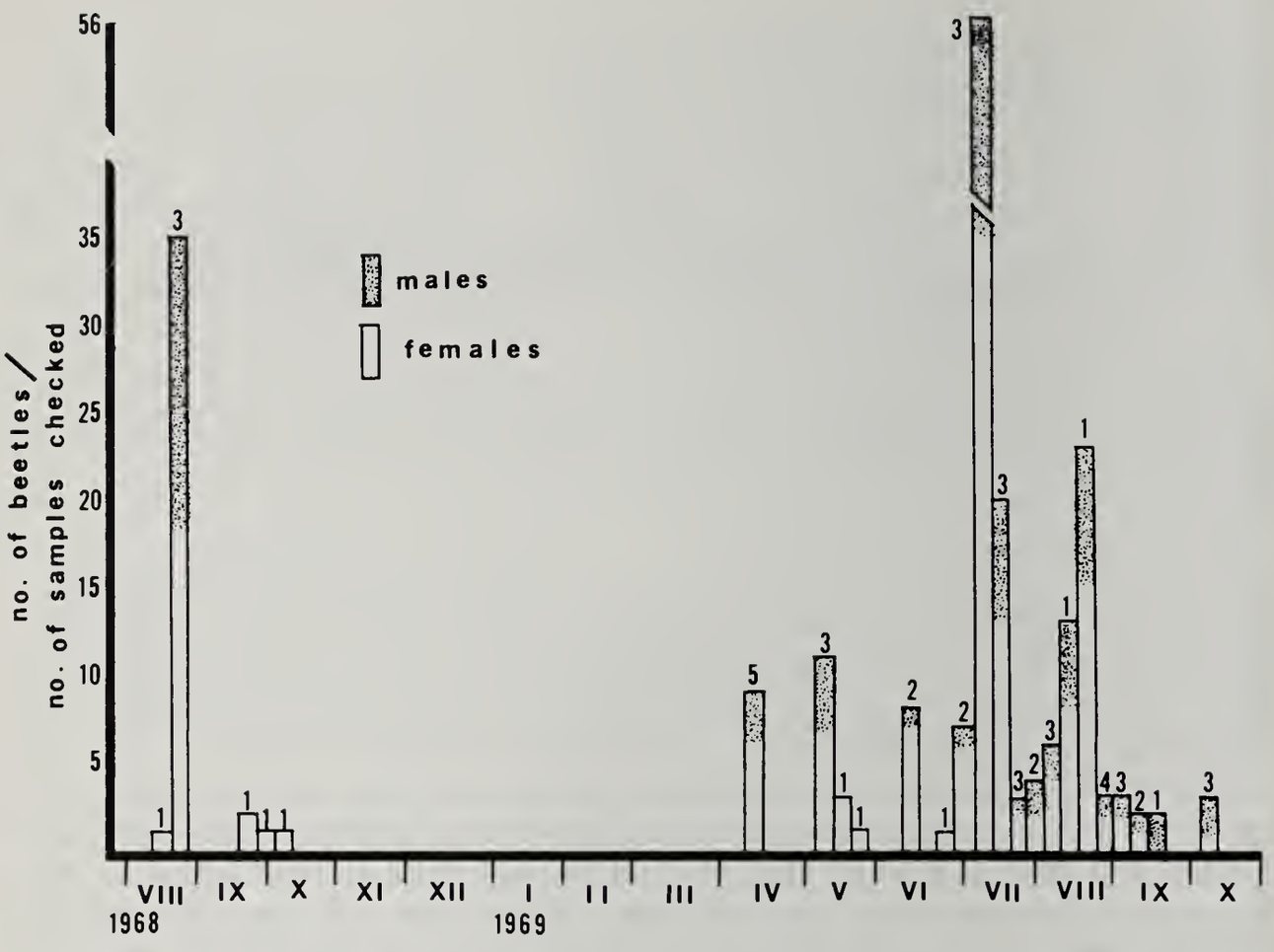

Fig. 3. *M. excavaticollis* collected from blacklight traps in Monticello, Florida in weekly intervals. Numbers above columns indicate number of daily samples included in summation.

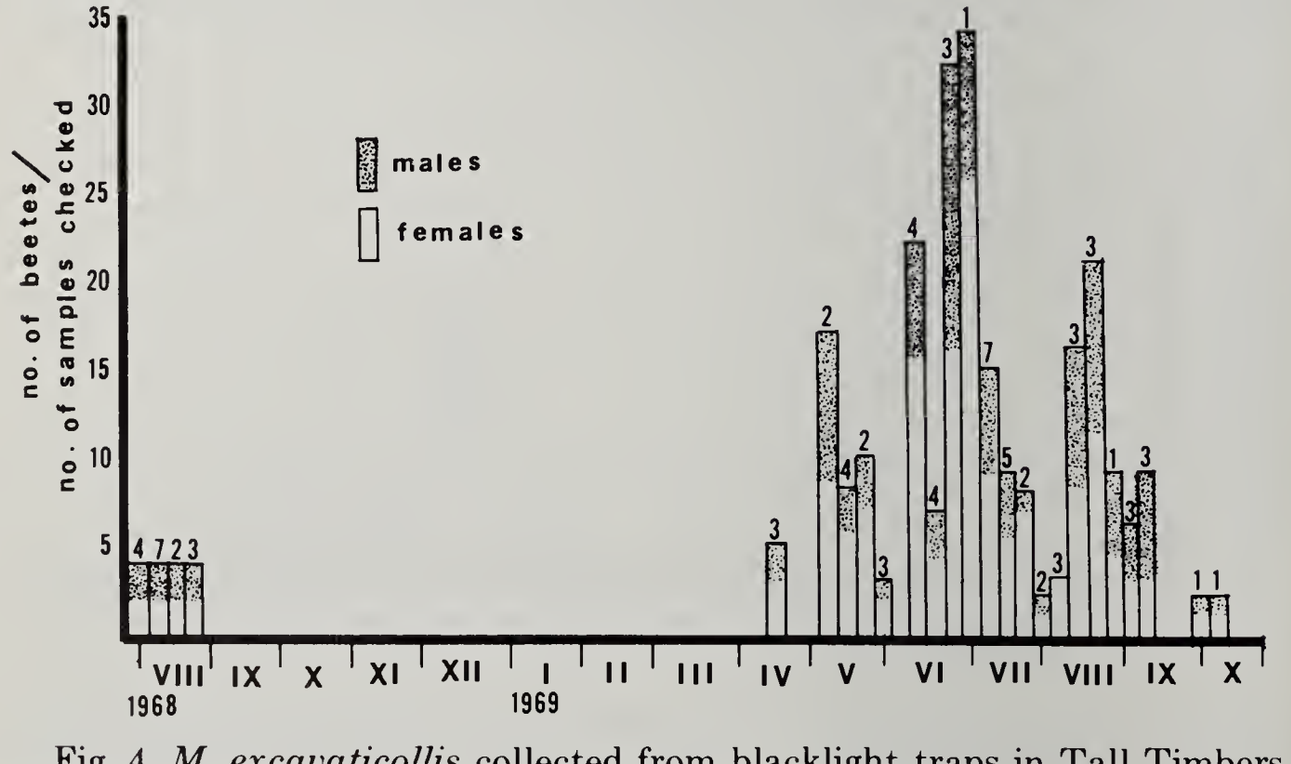

Fig. 4. *M. excavaticollis* collected from blacklight traps in Tall Timbers Research Station, Florida, in weekly intervals. Numbers above columns indicate number of daily samples included in summation.

et al. 1977). *M. excavaticollis* evidently is expanding its range faster than either of its imported hosts (Wojcik *et al.* 1977). *M. excavaticollis* and *E. castanea* have rarely been collected from the same mound (Wojcik *et al.* 1977); whether this is due to interspecific competition or other conditions is not known. However, as *S. invicta* increases in the Gainesville area and becomes the dominant ant, *M. excavaticollis* can be expected to become much more abundant.

The main flight period of *M. excavaticollis* occurred during the main period of mating flights of its most widespread host, *S. invicta* (Markin *et al.* 1971, Morrill 1974). However, there is no evidence that the 2 flights are directly related. Also, though newly mated queens of *S. invicta* lay eggs and intensely care for their first batches of brood (Markin *et al.* 1972), there are no reports associating *M. excavaticollis* and small, young colonies of *S. invicta*. The only report of an association between *M. excavaticollis* and newly mated queens is a collection (from under a small stone) of a *M. excavaticollis* near a newly mated *S. invicta* queen (Georgia: Tift Co., Tifton, 28-VII-70, W. A. Banks). *M. excavaticollis* feeds on larvae and pupae of its hosts (Wojcik 1975), which are not available in large quantities in new colonies.

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